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Diet and foraging behaviour of Purple Cochoa *Cochoa purpurea* in Namdapha National Park, India

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Introduction

The Purple Cochoa *Cochoa purpurea* is a scarce and secretive species found throughout the mid- to high-altitude broadleaved forests of the Himalaya, north-east India, China and South-East Asia (Robson 2008). The species is sluggish and often remains motionless in the canopy making it very difficult to see, particularly outside the breeding season when it is not vocal (C. Robson *in litt.*). Although the nest and eggs have been described (Whympers 1902), the diet and foraging behaviour of the species is poorly known. There are only two published records describing the diet of Purple Cochoa (from the gut contents of dead birds) (Baker 1924, D'Abreu 1931) and none documenting their foraging behaviour. They are thought to be facultative frugivores which feed on fruits and berries (species unknown), insects and molluscs (Baker 1924, D'Abreu 1931, Robson 2008, Rasmussen & Anderton 2012). They have been seen in *Ficus* trees, which possibly indicates that they feed on figs. No other fruits in their diet are known. Their role as seed dispersal agents has never been studied.

Purple Cochoas are thought to be nomadic, ranging widely in search of food, and are potentially altitudinal migrants in some parts of their range, but might be resident at certain altitudes in other parts (C. Robson *in litt.*). They have been recorded at altitudes ranging from 1,000–2,135 m in South-East Asia, although as low as 400 m in Cuc Phuong National Park, Vietnam (where the maximum elevation is 659 m) (Robson 2008), and 915–3,000 m in South Asia where they are thought to be mainly summer visitors, possibly influenced by the predominance of summer records (Rasmussen & Anderton 2012). However, at least two published articles report their presence in Mizoram and Arunachal Pradesh during winter and spring (Sangha 2001, Srinivasan *et al.* 2010), and at least one bird has been seen by birdwatchers in Nagaland on 6 January 2010 (S. Dalvi verbally). Because it is such a poorly known species, it is easy to make assumptions about its altitudinal limits and seasonal status.

Study area

Namdapha National Park (hereafter Namdapha) lies in Changlang district, eastern Arunachal Pradesh, India (27.392–27.661°N 96.251–

96.976°E). It has an altitudinal range of 200–4,571 m and covers an area of 1,985 km². The east and south-east boundaries of Namdapha border northern Myanmar. It has a very high diversity of avian species and has been designated an Important Bird Area together with Kamlang Wildlife Sanctuary to the north (Islam & Rahmani 2004). All our observations of Purple Cochoa were on Hornbill Plateau (about 15 km²) in Namdapha during the winters of 2010–2011 and 2011–2012. The plateau lies at an altitude of 500–700 m and is primarily covered with tropical evergreen forest.

The lowland forests of Namdapha have large numbers of trees of the Lauraceae, Meliaceae and Moraceae families, including the following species which produce fleshy fruits between 21–29 mm in diameter: *Prunus ceylanica*, *Beilschmiedia assamica*, *Phoebe paniculata*, *Phoebe* sp., *Alseodaphne petiolaris*, *Machilus duthiei*, *Aphanamixis* sp., *Dysoxylum* sp. and *Canarium strictum* (Datta 2001). These trees fruit during winter (November to February) and early summer (March to April) (Kanjilal & Bor 1998). The avian frugivores which are known to disperse the seeds of some, if not all, of these species in Namdapha are four species of hornbill, Mountain Imperial Pigeon *Ducula badia*, Great Barbet *Megalaima virens* and Hill Myna *Gracula religiosa* (Viswanathan 2012). Although it is believed Purple Cochoa have been seen previously in Namdapha by birdwatchers, only one report has been published—three birds heard singing/calling at 2,059 m on 18 and 20 December 2008 (Srinivasan *et al.* 2010). At the outset of our project, because of this paucity of records, we had not expected to observe Purple Cochoa in the study area and it had not been identified as a potentially important species in the context of our project on seed dispersal of forest trees.

Methods

As a part of our research project on seed dispersal by avian frugivores (RN unpubl. data, Viswanathan 2012), we systematically watched fruiting trees over two winter periods, November 2010 to March 2011 and November 2011 to February 2012. During each fruiting tree observation session, we watched frugivore behaviour for up to about four hours—starting between 06h00 and 06h30 and finishing between 10h00 and 10h30—while lying hidden

Table 1. The encounter rate of Purple Cochoa on the tree species sampled, and the diameter of fruits these trees produce. Sessions = number of 4-hour watches under each tree species; Cochoa visits = number of times Purple Cochoa were seen to visit trees. *Green Cochoa were also seen foraging on these species.

Tree species	Sessions	Cochoa visits	Fruit diameter (mm) \pm s.e.
<i>Beilschmiedia assamica</i>	10	3*	26.43 \pm 0.53 ($n = 9$)
<i>Alseodaphne petiolaris</i>	6	1* (1*)	21.82 \pm 1.2 ($n = 12$)
<i>Machilus duthiei</i>	4	1*	<15 (visual estimate)
<i>Prunus ceylanica</i>	6	1	22.25 \pm 0.14 ($n = 123$)
<i>Canarium strictum</i>	4	0	24.66 \pm 0.57 ($n = 25$)
<i>Phaebe</i> sp.	6	0	28.75 \pm 1.27 ($n = 15$)

under the tree. Tree species we found in fruit (the number of individual trees observed is shown in brackets) and which were in suitable locations to observe were: *Beilschmiedia assamica* (8), *Prunus ceylanica* (6), *Alseodaphne petiolaris* (5), *Machilus duthiei* (4), *Phoebe* sp. (6) and *Canarium strictum* (4). AV also informally observed *Aphanamixis* sp. (1) which began fruiting towards the end of February 2012. In most cases only one session was spent at a tree, but repeat sessions were carried out at two of the *Beilschmiedia* trees and one *Alseodaphne petiolaris* was also observed twice. We were able to measure the size (diameter) of the fruits produced by all these species (Table 1) except for *Machilus duthiei*. Although we did not formally measure the hardness of these fruits, we understand through handling them that *P. ceylanica*, *A. petiolaris* and *M. duthiei* have very soft pulps, *Phoebe* sp. and *C. strictum* have hard pulps, and *B. assamica* has pulp of intermediate hardness.

Results

Purple Cochoa were observed on eight occasions in all, six during our systematic observation programme—once in winter 2010–2011 and five times in winter 2011–2012—and two opportunistic observations in the same period. In addition, Purple Cochoa were heard (calling/singing) occasionally during the study period, and on 23 December 2011 a single bird responded to playback.

Details of the observations of Purple Cochoa during the course of our study were as follows (see also Table 1):

- (1) 26 November 2010: RN saw one male on *Beilschmiedia assamica*. It flew to a fruit, pecked at it, and then returned to perch; two fruits were pecked in this manner.
- (2) November 2011: RN saw a male and a female on *Alseodaphne petiolaris*. They appeared to be pecking at fruits in the same manner as (1). A flock of at least six Green Cochoa *Cochoa viridis* was foraging on the same tree, pecking at fruits; they occasionally perched in an adjacent tree before returning to continue foraging.
- (3) 18 December 2011: RN saw one male on *Machilus duthiei*. The bird was swallowing fruits—after flying to perch near a fruit, it would fly to it, pluck it and settle back in the canopy before ingesting it (see Discussion).
- (4) 16 January 2012: RN saw two individuals on *Beilschmiedia assamica* between 08h47 and 08h49, then four individuals at 09h43, but all were then lost to sight in the canopy. Both males and females were seen. In all, Purple Cochoa were observed for about 12 minutes, during which time the birds pecked and dropped fruits on five occasions.
- (5) 24 January 2012: AV saw one male at 07h45 on *Prunus ceylanica*. It perched alongside some ripe fruits, immediately plucked a fruit and disappeared into the canopy. It was subsequently visible on the tree for short intermittent periods but was not seen to forage again.

- (6) 25 January 2012: AV saw two males at 07h58 on *Beilschmiedia assamica*. They were seen flying to fruits and possibly pecking at them before flying back into the canopy. At 08h25, one bird plucked a fruit and retired into the canopy. The two birds sat motionless and were very difficult to see until 09h36. The sound of falling seeds when the birds were resting indicated that they might have regurgitated seeds from the fruits they ate. At 09h36, five more Purple Cochoa (three males and two females) visited the tree and began foraging. This time they were seen swallowing fruits on at least four occasions. They easily swallowed fruits apparently almost double the size of their gapes. Several fruits were dropped too. These birds foraged (although not all at the same time) until 09h56, during which period AV took a few photographs. At 09h59, two birds ingested one fruit each. Three to six birds were still on the tree at 10h15 when AV completed his observation session. One Mountain Imperial Pigeon was seen intermittently foraging on the same tree during the entire period.

Additional observations were as follows:

- (7) 15 February 2012: at about 09h00 AV had an opportunistic sighting of one male sitting in the upper canopy of an unidentified tree. A Purple Cochoa had been calling some time previously from the vicinity of an unidentified Lauraceae tree with ripe fruits, but AV did not see it visiting a fruiting tree.
- (8) 28 February 2012: AV saw a male and a female on *Aphanamixis* sp. at about 15h00. There were two bouts of foraging activity between 15h00 and about 16h00. The birds foraged in the same manner as observed previously and ingested several fruits (arils).

Green Cochoa were seen more frequently at the study site than Purple Cochoa, mainly on *Ficus* sp., but were infrequently seen on the targeted trees during observation sessions. Green Cochoa fed in a similar manner to Purple Cochoa (see below), but were usually in small flocks and seemingly less concerned about concealment.

Discussion

Distribution

We saw Purple Cochoa on seven occasions during the winter of 2011–2012 at the study site, but almost always only on the fruiting trees which we were systematically sampling to collect data for our main studies. This indicates how difficult it is to see Purple Cochoa during winter and raises questions about their reported seasonal status in South Asia. Perhaps their status as mostly summer visitors to the region (with winter distribution unknown) has to be re-examined. It is possible that they are resident in South Asia but are completely overlooked due to their relative inactivity and inconspicuousness outside the breeding season. This is the first time a population has been documented throughout winter (November to February) in South Asia.

During the winter of 2011–2012, several higher-altitude species were seen at unusually low elevations in Namdapha (AV and RN pers. obs.); this phenomenon may have been driven by an unusually severe winter. The relatively large number of Purple Cochoa seen was possibly a reflection of the same. However, we did see one Purple Cochoa in November 2010 in the same area, indicating that they do visit lower altitudes at other times. The sightings reported here—between 500–600 m—are some of the lowest altitudinal records for the species. However, a propensity to move far and erratically in search of food (C. Robson *in litt.*) may see them regularly occur at lower altitudes, where they go unnoticed.

Diet and foraging behaviour

Purple Cochoa (and Green Cochoa) have an unusual foraging technique compared with other frugivores (e.g. hornbills, pigeons, barbets and mynas). They almost sally, like flycatchers, limiting the time they spend active in the open. They usually remain hidden in

the foliage of the fruiting tree and fly to the fruits, perching briefly near them without attempting to seize one from this perch. They then flit to a fruit, remove it or peck at it in one quick motion, and fly directly back into the canopy to perch out of sight once more and ingest it. Fruits are often dropped in the process. Once a fruit has been swallowed, the bird may repeat the procedure. An individual has bursts of foraging activity during which it swallows two to three fruits and rests for long periods in between; the Purple Cochoa has the ability to remain completely still for long periods, and are then very difficult to see. The foraging bouts are relatively long because fruits are dropped, although it is not clear whether this is because the fruit is not at the stage of ripeness the bird prefers or simply due to clumsiness. Often several attempts appear to be unsuccessful and many fruits are dropped.

The 'sallying' behaviour may be a consequence of their inability to remove large fruits while perched on a branch, but it may also be an adaptation which minimises the time they spend actively in the open. Contrary to typical thrush behaviour (pecking at large fruits, often on the ground), we found that they also swallow some large fruits whole and regurgitate seeds. However, they may find it difficult to handle large fruits, as they were seen to drop fruits several times, but it is possible that the fruits were dropped deliberately because they were being rejected for some reason. We sometimes saw Purple Cochoa pecking at fruits, rather than seizing them, but these might have been failed attempts to remove them.

We observed Purple Cochoa feeding on the fruits of five species of fruiting tree. This is the first documentation of fruits of specific trees in the diet of the species. Although they appear to swallow fruit with diameters greater than 20 mm (Table 1), they were not seen to feed on either *C. strictum* or *Phoebe* sp., possibly because these fruits are generally too large to ingest or are too hard. We also observed Green Cochoa feeding on the fruits of *A. petiolaris* on two occasions, and once on the fruits of *M. duthiei*, which they plucked and swallowed whole.

As they spend long periods foraging on fruiting trees, Purple Cochoas may be highly frugivorous birds. In fact, only hornbills were encountered more often than cochoa on *B. assamica* during fruiting tree observation sessions. On *Prunus ceylanica*, Mountain Imperial Pigeon, Great Barbet and Hill Myna were seen more often than Purple Cochoa. The only other frugivore we have seen feeding on the fruits of *Aphanamixis* sp. is Austen's Brown Hornbill *Anorrhinus austeni*, although several other species probably do so. Purple Cochoa may therefore be important dispersers for these tree species. However, they may not disperse these seeds far from the parent tree as they often sit on the same or a neighbouring tree after feeding, as do Great Barbets and Hill Mynas (Viswanathan 2012).

The fruits which we have reported in the diet of Purple Cochoa are large and lipid-rich. This might indicate that the species feeds on several types of large lipid-rich fruits (at least in winter) and is similar to frugivores like hornbills and imperial pigeons in this respect. Large fruits from the families Lauraceae and Meliaceae, which depend almost exclusively on hornbills, pigeons and occasionally barbets and mynas for dispersal (Corlett 1998), are also potentially dispersed by Purple Cochoa (and other cochoa species).

In forests where numbers of large frugivores are greatly diminished (Corlett 1998), cochoa species may be particularly important for continued dispersal of large bird-dispersed seeds.

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